

A Better Way to Measure Fat

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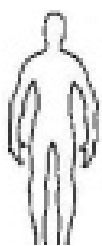
A Better Way to Measure Fat  
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Marines have been commonly referred to as “lean, mean, fighting machines.” Today there are currently 2,112 Marines on weight control. That means approximately two percent of all Marines active today are being affected by the current system by which we measure body fat. The Marine Corps’ current system of tape measurement to determine body fat is the least accurate of multiple modern methods now available to the public. Using more advanced methods would reduce human error and increase standardization throughout the Marine Corps.

### *Current Method*

Initially when the Marine Corps began testing for body fat in 1981 (DoD Directive 1308.1, 29 June 1981) using the Navy formula, few alternatives existed. Those that did were expensive and cumbersome. The current tape measurement system used by the Navy and Marine Corps To estimate body fat content, as a percentage of weight, uses the equations of Wright, Dotson, and Davis. These equations had been developed for the U.S. Marine Corps as part of its weight control policy. Body fat content was estimated from neck and abdomen circumferences for men, and neck, abdominal, biceps, forearm, and thigh circumferences for women.<sup>1</sup>



Ectomorphs



Endomorphs



Mesomorphs

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<sup>1</sup> For more information on current fat percentage evaluation in the Navy and Marine Corps see, Hodgon 9.

Because appearance and weight affect the frequency with which a Marine is measured, certain body types were predisposed to have difficulty.<sup>2</sup> For example, the ectomorphs seldom get measured in the Marine Corps because of their characteristically low muscle mass and lean figure, this does not guarantee they would pass an accurate fat percentage test. Mesomorphs typically have a natural muscle mass and tend to gain muscle mass easier than ectomorphs. If actively involved in weight training it is likely this body type will be measured often for body fat. However, if they have a good diet and practice cardiovascular training the probability of being within standard is high. Endomorphs are the most likely to exceed Marine Corps standards for fat percentage when measured because they are characterized by larger bones, round face, large trunk and thighs.

Endomorphs are more likely to fail a body fat tape measurement regardless of their sex, physical fitness routine or diet due to their characteristically large lower bodies and narrow upper body. This does not necessarily mean they have more body fat than others who make weight or pass the tape measure test.<sup>3</sup>

With the popularity of weight lifting spreading throughout the Marine Corps, more Marines are being measured due to muscle mass gains, which can significantly increase weight.<sup>4</sup>

Making a move to a modernized “fat test” would ultimately be a more accurate assessment of health and body fat content than scales or tape measures.

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<sup>2</sup> For a discussion on the different body types and what they represent, see Venudo 4.

<sup>3</sup> For a discussion on how soldiers who passed weight regulations were actually fat see, Friedl 5.

<sup>4</sup> For more information on fat and muscle density, see Lukaski 2.

### *Advanced Alternatives*

The most accurate of all methods used to measure fat is the water displacement technique. This requires a tank and is both expensive and cumbersome; however, water displacement could be an option for base gyms. Many other methods are available these days from Ultra-sonic to dual energy X-ray absorptiometry. Both of these methods are very accurate, but would require a medical facility. The caliper method is the most commonly used amongst sports trainers and physicians.<sup>5</sup> The Caliper method is easy to perform and takes little more time than the tape measure.<sup>6</sup> Although the Caliper method is effective, it is also intrusive and can be uncomfortable.

The solution is to use bioelectrical impedance analysis. Which leaves little room for human error, is accurate and is non-intrusive. This method simply requires a Marine to stand on a scale bare-foot for 30-45 seconds while electrodes painlessly course through the body and calculate a percentage of fat from density variation <sup>7</sup>.

### *A small study*

A group of University of Kansas seniors conducted a study using five volunteer Marines from 9<sup>th</sup> Marine Corps District Headquarters in Belton Missouri in 1997. First, they measured the five Marines using the current Navy tape measure technique. They then had the Marines lie on their backs and connected electrode emitters to the feet, abdomen, and thighs. This early model of bioelectrical impedance analysis demonstrated the potential disparity between the

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<sup>5</sup> For more information on the effectiveness of different methods in analyzing fat percentage see, Neporent 7.

<sup>6</sup> For more information on the effectiveness of the four-fold Caliper method see, Peterson 6.

<sup>7</sup> For more information on how bioelectrical impedance works see, Doyle 1

techniques. Three of the five Marines had a difference greater than eight percent and the remaining two had differences of five percent or greater.

A larger scale survey would be needed to more accurately assess the disparity in accuracy of the tape measure method. With the cost of bioelectrical impedance analysis machines significantly lowered through recent market competition it could well be worth taking a closer look at them.

### *Counter Arguments*

Cost is a minor issue, on the open market today, the cost for a similar tape measure used to perform current body fat percentage tests can be found for approximately \$4.00. A caliper can be purchased on the open market for \$12.00. A bioelectrical impedance analysis machine can be purchased for about \$48.00. However, accuracy, ease of use, and portability make the bioelectrical impedance analysis machine a cost effective way of increasing effectiveness of testing and reducing human error. To maintain quality standards, the Marine Corps could bulk purchase and distribute the machines or authorize specific brands for purchase with unit funds.

### *In Conclusion*

There were 60 Marines discharged last year due to weight control and promotions are effected as well.<sup>8</sup> With a more accurate system the Marine Corps' numbers on personnel assigned to weight control could go up or down. That is not the point. Regardless of the outcome there would be less of a chance that a Marine is not getting promoted in error or is denied promotion or retention unfairly

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<sup>8</sup> To find out information on Manpower Management issues see, Friodola 7.

It is not condoning over-weight Marines, but simply a matter of using available technology to best benefit Marines. Perhaps it is time the Marine Corps takes a closer look at how it evaluates fat percentage and potentially set a trend for other services to follow as we have done with uniforms and tactics. If testing and fielding this technology helps only five percent of the Marines in the Corps, it would be money well spent.

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